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Probing the anharmonicity of the potential well for a magnetic vortex core in a nanodot

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Abstract

The anharmonicity of the potential well confining a magnetic vortex core in a nanodot is measured dynamically with a magnetic resonance force microscope (MRFM). The stray field of the MRFM tip is used to displace the equilibrium core position away from the nanodot center. The anharmonicity is then inferred from the relative frequency shift induced on the eigenfrequency of the vortex core translational mode. An analytical framework is proposed to extract the anharmonic coefficient from this variational approach. Traces of these shifts are recorded while scanning the tip above an isolated nanodot, patterned out of a single crystal FeV film. We observe a +10% increase of the eigenfrequency when the equilibrium position of the vortex core is displaced to about one-third of its radius. This calibrates the tunability of the gyrotropic mode by external magnetic fields. © 2013 American Physical Society.

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